

PROPOSED 2018 Joint Rover Mission



Plans for Proposed 2018 NASA & ESA Joint Rover Mission Landing Site Selection

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MEPAG

Lisbon, Portugal

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v. 6



- **Use Process Similar to MSL, MER**
 - Community Involvement Critical – Samples would be Legacy
 - International in Scope – Joint Mission
 - Call for Sites to expand pool of potential sites
 - Then evaluate and Progressively Downselect
- **Start Early (Now!) – June 2011**
 - MRO, ODY, MEX Not Getting Younger
 - MRO Observation Resolution and Spectra (HiRISE, CTX, CRISM) uniquely suited to site characterization and certification (HiRISE)
- **Broad Agreement on Plan - NASA/ESA, Mars Program, MRO**
 - NASA and ESA have chartered process patterned after MSL & MER
 - Co-chairs named: Matt Golombek, John Grant, Nicolas Mangold



- **Start out Seeking as Many Sites as Possible**
 - Broad Net to Capture all Scientifically Interesting Sites within Engineering Constraints
 - MSL Started with ~30, Narrowed Down to 4
 - Initial Imaging 1-2 MRO Image Targets [HiRISE, CTX, CRISM]
 - Evaluate Science and Safety to Narrow Down
 - Collect More Data on Remaining Sites
 - Complete Data Needed for Certification [complete CRISM, stereo HiRISE, CTX]
- **2018 Preliminary Engineering Constraints**
 - $\pm 30^\circ$ Latitude
 - < 0 km Elevation wrt MOLA Geoid
 - 25 x 20 km Ellipse Size
 - Other Constraints, e.g., Slopes and Rocks, Similar to MSL
 - Considering Hazard Avoidance in engineering capability trades to capture as many sites as possible in process
 - 300 m TRN, 5 m Terminal Divert



- **June 2011 – Call for Imaging Potential New Sites**
 - Early Imaging Opportunity for Potential 2018 Landing Sites
 - Abstract Template with Engineering Constraints
 - Target Images in Advance of First Workshop
- **January 2012 - First Landing Site Workshop**
 - Request Community Suggestions for Landing Sites
 - First Announcement at MEPAG June 2011
- **Why is this the time to start?**
 - MSR Science Objectives Known
 - E2E-iSAG Report; 2018 Highest Priority Decadal Survey-Recommended Flagship
 - Project Office Established
 - Preliminary MSR Engineering Constraints known (based on MSL)
 - MSL Site Selection Will Soon Be Made
 - MRO has agreed to collect landing site data
 - Already Imaging Reference Landing Sites identified by E2E-iSAG



- **Have at earliest practical date ~January 2012**
 - Announce 6 months before – Now!
 - Will have first set of data from June 2011 Imaging call
 - Will have images of Reference landing sites
- **Goals of 1st Workshop**
 - List of Potential Sites – Order 30, but more OK
 - Prioritize sites for acquisition of additional data
 - Categorize High/Medium/Low priority (with top ~10 list)
- **Follow on to first workshop**
 - Target THEMIS, HRSC, MRO Images of landing sites
 - More Images to Higher Priority Sites
 - Issue CDP Call for Characterizing Highest Ranked Sites
 - Top 5-10 Sites
 - 15 Months to Acquire Images and Evaluate Sites before Second workshop



Proposed 2018 Caching Mission for Mars Sample Return

- **Incorporates 9 mo of MSL Surface Ops results – Lands 8/12**
- **Instruments Selected; Joint PSG Formed, 1/13**
- **15 Months to Acquire MRO Data**
 - 3 Images per Cycle; ~60 Cycles; 120 Images
 - 5 Images per New Site or 2.5 Stereo Pairs
- **Solicit New Potential Landing Sites**
 - Accommodate advances in our understanding of Mars, Mission Changes
- **Specific Discussion of What 2018 Could Do/Sample at Sites**
 - How well would site address proposed Science Objectives of 2018?
 - Both *in situ* (subsurface) and sample science
- **Characterization of Landing Sites**
 - How well would sites satisfy engineering constraints?
- **Downselect to ~12 Landing Sites Based on Science & Safety**
 - Prioritize 12 Sites Into at Least 2 Groups
 - 16 Months to Image 12 Sites

JPL LANDING SITE SELECTION TIMELINE



Proposed 2018 Caching Mission for Mars Sample Return

- 5/18 Proposed Launch
- 1/18 Project Rec., Peer Review, Hq Selection
- 9/17 5th, Final Workshop ~1 Site
- 6/17 [L-1 yr] Selection/Target Landing Site Zone/LV
- 1/17 4th Workshop ~4 Sites
Review & Recommend Landing Site Zones
- 9/15 Third Landing Site Workshop ~6 Sites
- 5/13 Second Landing Site Workshop ~12 Sites
- 1/12 First Landing Site Workshop ~30 Sites
- 6/11 Preliminary Engineering Constraints Defined
» Science Objectives from e2e SAG

Reference Landing Sites



Site	Lat (°N)	Lon (°E)	Elev. (km)	Description
Gusev Crater*	-14	175	-1.9	Hesperian olivine-rich basalts embay the Noachian Columbia Hills, which contain outcrops of opaline silica likely produced from hot springs or geysers and outcrops rich in Mg-Fe carbonates likely precipitated from carbonate-bearing solutions. Sulfate-rich soils and outcrops also are present along with several different igneous rock types with minimal alteration. Landing Site for MER Spirit Rover
Jezero Crater	18.4	77.6	-2.6	elevation to east. Delta incorporates phyllosilicates. The crater formed in Noachian olivine and pyroxene-rich crust. The floor has a more recent unit (Hesperian?) that looks like volcanic flows that embay the delta. Would land on volcanic and traverse to delta, but rocks on volcanic surface in likely landing ellipse a concern for MSL candidate site.
Nili Fossae Trough*	21	74.5	-0.6	Landing ellipse on floor of Trough with land on access to likely Hesperian volcanics and diverse mineralogies in Hargrave crater ejecta (including carbonate-bearing materials). Widespread altered materials to west of ellipse in canyon eroded into western wall of Trough. Elevation is -0.6 km and exceeds current limit for 2018.
Mawrth Valles Site 0	24.5	339	-3	Layered Phyllosilicates in poorly understood setting. unaltered volcanic materials within ~50 km in Oyama crater. Possible mud volcano in the vicinity. Terrain displays more relief than candidate MSL landing site to the east.
E. Marg. Terra*	-5.6	354	-1.3	possible chlorides stratigraphically overlain by an eroding unit with very strong CRISM and even TES signatures of phyllosilicates. Appears capped by a basaltic unit of Noachian age (in situ?). Relief in ellipse was challenging for MSL candidate site.
NE Syrtis Major*	16.2	76.6	-2.1	Extensive and diverse mineral assemblages with Syrtis Major volcanic nearby. Maybe fluvial deposits, but any lacustrine only in small local basins. Relief in ellipse was concern for MSL candidate site. Land on diverse altered mineralogies, but volcanics are go to.
Ismenius Caus	33.5	17	~3	Single site to combine clay-bearing paleolake sediments and current glacial deposits. Three deltas (in blue) at the same elevation=> Confirms paleolake. Great site for both geological "field work" and sampling. Least imaged and most northern of sites. Putative ice-bearing deposit may be Planetary Protection concern.

6/17/11

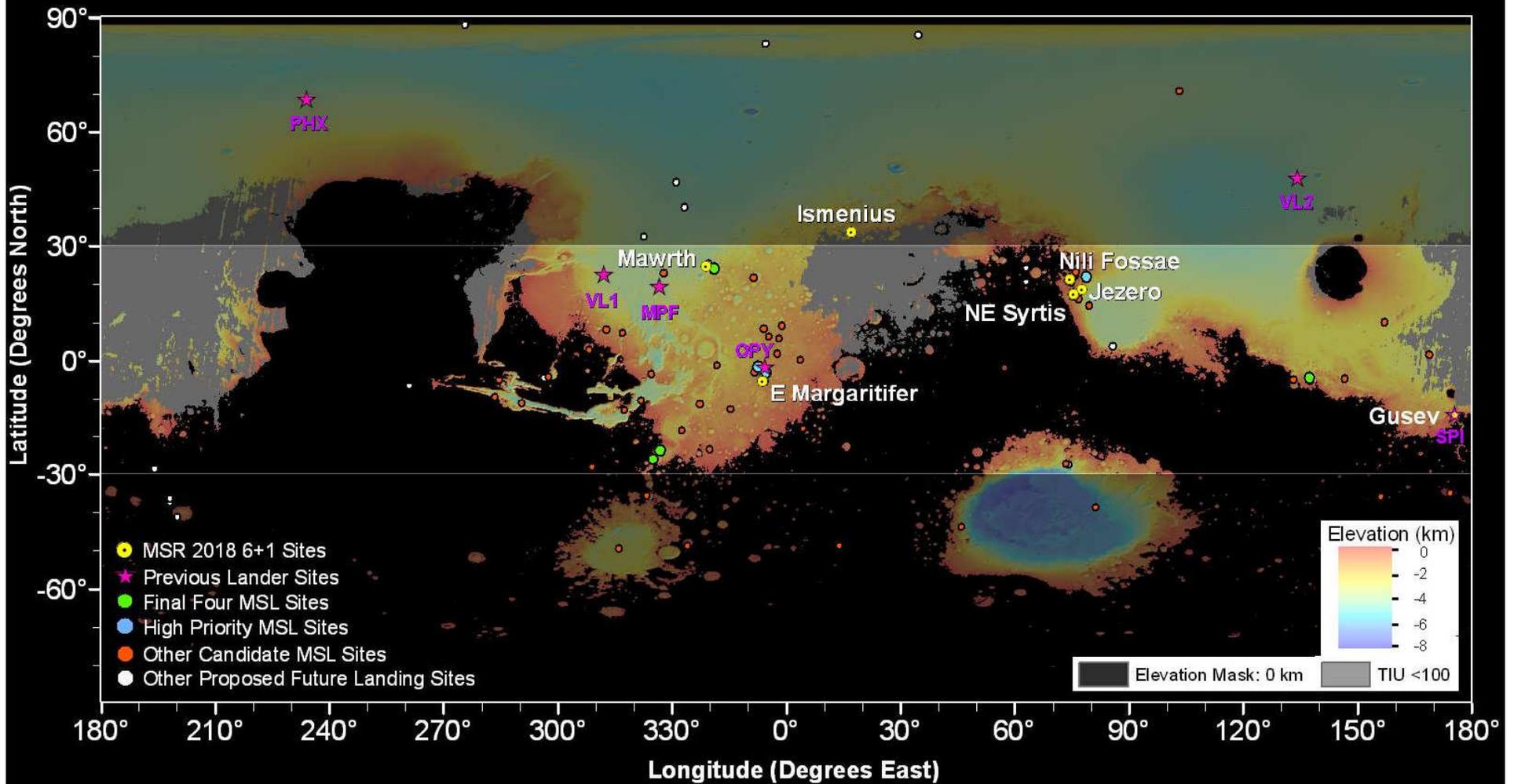
*well imaged &/or well characterized *Pre-decisional; For planning and discussion purposes only*

From e2e SAG

2018 6+1 Landing Constraints

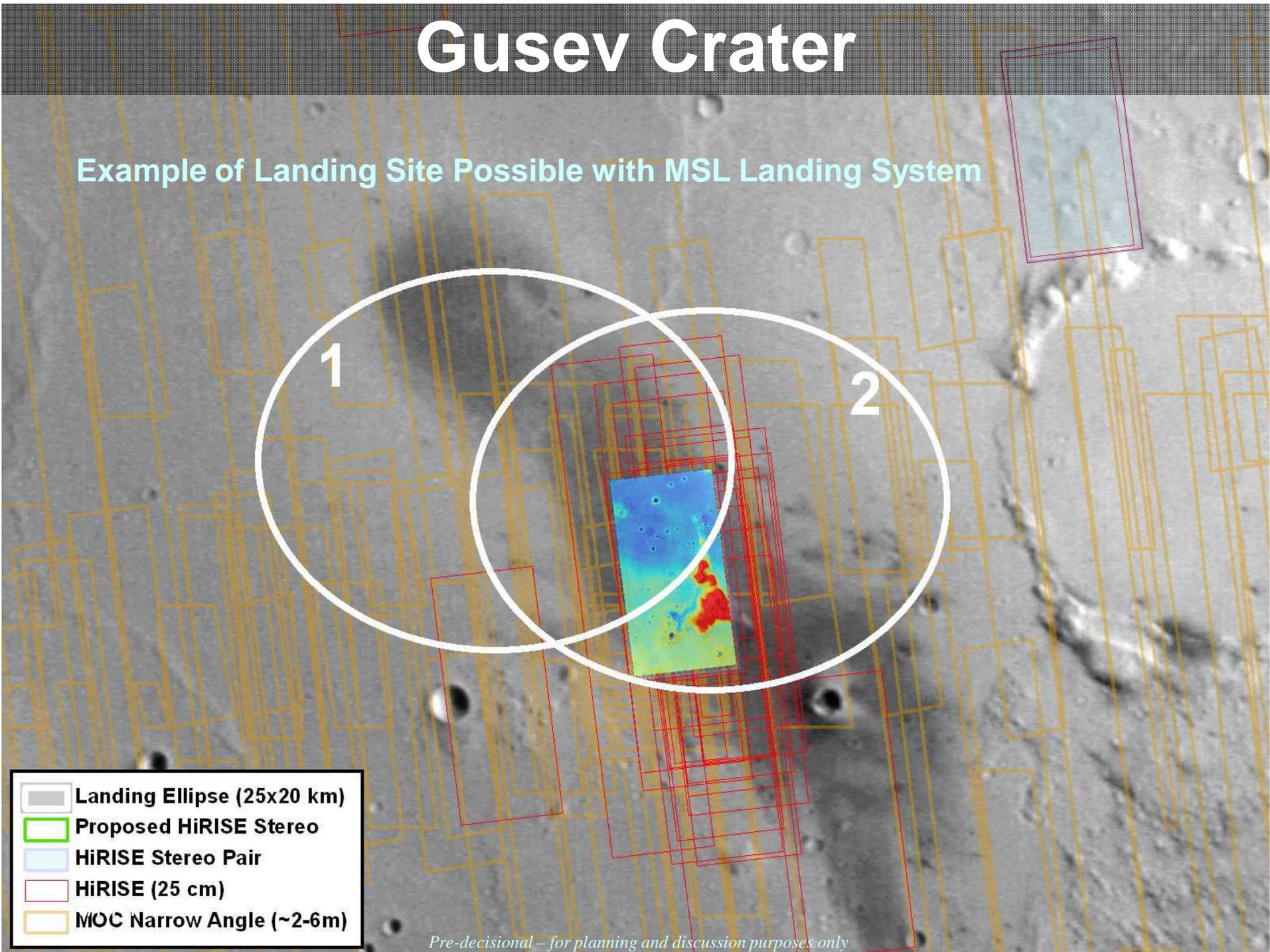


Proposed 2018 Caching Mission for Mars Sample Return



Gusev Crater

Example of Landing Site Possible with MSL Landing System



Pre-decisional – for planning and discussion purposes only